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REMARKS

Entry of this Amendment is proper because it narrows the issues on appeal and does not require further search by the Examiner.

Applicant gratefully acknowledges the teleconference which was conducted with the Examiner in this Application on Friday, August 29, 2003. Applicant further notes that during the teleconference, the Examiner stated that the cited references do not appear to teach or suggest *"wherein said positive electrode is connected by a bonding wire to a same surface of one of said first and second bonding pads as one of said pair of lead frames"* as recited in claims 14 and 19.

Claims 14-38 are all the claims presently pending in the application. Claims 14, 17-19, 21 and 25-26 have been amended to more clearly define the invention.

It is noted that the claim amendments are made only for more particularly pointing out the invention, and not for distinguishing the invention over the prior art, narrowing the claims or for any statutory requirements of patentability. Further, Applicant specifically states that no amendment to any claim herein should be construed as a disclaimer of any interest in or right to an equivalent of any element or feature of the amended claim.

Claims 14-24 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Genriyou (Japanese Patent Application No. 10-151794), in view of Nemoto, et al. (U.S. Patent No. 6,025,213) and in view of Yamada, et al. (U.S. Patent No. 6,239,490). Claims 25-37 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Genriyou, in view of Nemoto, et al., in view of Yamada, et al. and in further view of Hide, et al. (U.S. Patent No. 5,966,393). Claim 38 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Genriyou, in view of Nemoto, et al., in view of Yamada, et al. and in further view of Oshio, et al. (U.S. Patent No. 6,274,890).

These rejections are respectfully traversed in the following discussion.

I. THE CLAIMED INVENTION

The claimed invention as recited, for example, in claim 14, is directed to a semiconductor light-emitting apparatus of a flip chip bonding-type. The apparatus may include a transparent base including an inorganic material which has on one side thereof a first bonding pad and a second bonding pad to be connected to a pair of lead frames with a

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space between the first and the second bonding pads where a semiconductor light-emitting element is fixed. Further, the light-emitting element may include a light-emitting layer, a substrate disposed between the light emitting layer and the base, and a positive electrode. Further, the positive electrode may be disposed on an opposite side of the light-emitting layer from the substrate and reflect light from the light-emitting layer in a direction through the substrate and the base.

Importantly, the positive electrode is connected by a bonding wire to the same surface of one of the bonding pads as one of the pair of lead frames. Specifically, the novel design of the present invention allows the use of bonding wires for connecting the electrodes of the light-emitting element to the bonding pads on the base. This allows the bonding pads to be formed on the base so as to maximize a distance between the lead frames, which facilitates attachment of the lead frames to the bonding pads.

The claimed invention as recited, for example, in claim 21, is directed to a light-emitting diode which includes a sapphire substrate, a light emitting layer made of GaN semiconductor and formed on the sapphire substrate, and a positive electrode and a negative electrode electrically coupled to the light emitting layer. The positive electrode and negative electrode are supplied with electricity through a wire. The positive electrode includes a reflective material for reflecting light from the light emitting layer toward the sapphire substrate and covers substantially an entire surface of the light-emitting layer.

Importantly, the positive electrode has a thickness of at least 5000 Å to prevent light leakage. This feature helps to ensure that light emitted in a non-dominant light-emitting direction may be reflected back by the positive electrode (e.g., in a dominant light-emitting direction) (e.g., Application at page 12).

The claimed invention as recited, for example, in claim 26, is directed to a semiconductor light-emitting apparatus which includes a base, first and second bonding pads formed on a first surface of the base, a light-emitting element formed between the first and second pads on the first surface of the base. The light-emitting element includes a substrate, a light-emitting layer formed on the substrate, and a first electrode disposed on an opposite side of the light-emitting layer from the base and reflecting light from the light-emitting layer through the base.

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Importantly, in this exemplary embodiment, the apparatus further includes a fluorescent material which is adjacent to the substrate and on an opposite side of the substrate from the light-emitting layer. The novel design of the Applicant's invention allows a fluorescent material to be included so that light of a constant color can be emitted for an extended period of time.

The prior art references do not appear to teach or suggest these novel features.

II. THE PRIOR ART REFERENCES

A. The Genriyou, Nemoto and Yamada References

The Examiner alleges that Genriyou would have been combined with Nemoto and Yamada to form the claimed invention of claims 14-24. Applicant submits, however, that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of the claimed invention.

Genriyou discloses a light-emitting device which is intended to stabilize light-emitting characteristics and to improve light utilization efficiency, by forming a light taking-out part side and an electric connection part side (Genriyou at Abstract).

Nemoto discloses a semiconductor light-emitting device for emitting light to a semiconductor substrate in the upper direction and a package window portion formed of a transparent heat sink. The device is bonded to the package window portion in accordance with an interconnection pattern (Nemoto at Abstract).

The Examiner concedes that the combination of Genriyou and Nemoto does not disclose each and every feature of the claimed invention. However, the Examiner alleges that the Genriyou/Nemoto combination would have been further combined with Yamada to form the claimed invention.

Yamada discloses a p-contact for a group III nitride semiconductor device. The p-contact is formed by depositing an electrode layer of palladium on an exposed surface of the contact layer in the device (Yamada at Abstract).

However, Applicant submits that these references would not have been combined as alleged by the Examiner. Indeed, these references are directed to different problems. Specifically, Genriyou is intended to improve light efficiency by forming a light taking-out part side and an electric connection part side, and Nemoto is intended to address heat

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problems in a light-emitting device package (Nemoto at col. 2, lines 20-27) whereas Yamada is merely directed to a p-contact which allegedly has a low resistance, and is reliable and inexpensive (Yamada at col. 3, lines 11-22). Therefore, these references are completely unrelated, and no person of ordinary skill in the art would have considered combining these references, absent impermissible hindsight.

Further, the Examiner can point to no motivation or suggestion in the references to urge the combination as alleged by the Examiner. Indeed, the Examiner supports the combination by merely stating that it would have been obvious to combine Genriyou and Nemoto to mount the lens to the external electrodes, and to combine the Genriyou/Nemoto combination with Yamada to reduce the voltage required to drive a given current. However, this is completely unrelated to a purpose of the claimed invention and, therefore, insufficient to support the combination.

Moreover, none of these references teaches or suggests "*wherein said positive electrode is connected by a bonding wire to the same surface of one of said first and second bonding pads as one of said pair of lead frames*" as recited, for example, in claims 14 and 19. Nor do these references teach or suggest "*wherein said positive electrode has a thickness of at least 5000Å*" as recited, for example, in claim 21.

As noted above, in an exemplary embodiment of the present invention, the positive electrode is connected by a bonding wire to the same surface of one of the bonding pads as one of the pair of lead frames (Application at page 6, line 12-page 7, line 17). The novel design of the present invention allows the use of bonding wires for connecting the electrodes of the light-emitting element to the bonding pads on the base. This allows the bonding pads to be formed on the base so as to maximize a distance between the lead frames, which facilitates attachment of the lead frames to the bonding pads.

In addition, conventional light-emitting devices typically have a positive electrode which is formed only on a portion of a group III nitride layer. Therefore, if such a device is mounted in a flip chip manner, only a small portion of the light emitted away from the non-dominant light-emitting path will likely be reflected by the positive electrode.

In one exemplary embodiment of the claimed invention, on the other hand, a light-emitting device includes a positive electrode having a thickness of at least 5000Å (Application at page 12, lines 2-3). Therefore, in the claimed device, at least a large part of

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the light emitted in a non-dominant light-emitting direction will be reflected back by the positive electrode in a dominant light-emitting direction.

Clearly, the cited references do not teach or suggest these novel features. Indeed, none of these references discusses at least one of the problems (e.g., lack of precision in connecting lead frames, and decreased luminous efficiency due to light in a non-dominant direction not being reflected) that the claimed invention seeks to address.

Further, Genriyou certainly does not disclose the novel features of the claimed invention. Specifically, Genriyou discloses a bonding wire connecting a light-emitting chip 102 directly to a lead frame. That is, Genriyou does not even disclose a bonding pad, therefore, Genriyou certainly does not disclose a bonding wire which connects a positive electrode to the same surface of one of the bonding pads as one of the pair of lead frames. Indeed, on page 2 of the Office Action, the Examiner concedes that Genriyou does not disclose such bonding pads. Therefore, Genriyou clearly does not teach or suggest the claimed invention.

The Examiner alleges that Nemoto discloses bonding pads. The Examiner relies on Figure 15E and col. 10, line 66-col. 11, line 4 in Nemoto to attempt to support his allegations.

However, even assuming that Nemoto discloses bonding pads, Nemoto does not teach or suggest the unique configuration as in the claimed invention. Specifically, Nemoto does not teach or suggest a bonding wire which connects a positive electrode to the same surface of one of the bonding pads as one of the pair of lead frames. Indeed, the Nemoto device forms both the positive and negative electrodes on the same side of the light-emitting device, then bonds the electrodes to the package 32.

In other words, there is no need for a bonding wire for connecting an electrode to a bonding pad. Instead, Nemoto merely uses interconnect layers 41 for connecting the device 51 to the lead frame 58. Moreover, unlike the bonding wires in the claimed invention, in Nemoto the interconnection 41 merely connects to the side surface of the electrode pad 42. The lead frame 58, on the other hand, connects to the bottom surface of the electrode pad 42. As noted above, such a design would clearly not address the problems which the claimed invention was intended to address.

Therefore, Nemoto and Genriyou have completely unrelated designs and it would have made no sense to combine these references as alleged by the Examiner. Moreover, even

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if combined, the combination would not teach or suggest a positive electrode connected by a bonding wire to the same surface of one of the first and second bonding pads as one of the pair of lead frames.

The Examiner further alleges that the Genriyou/Nemoto combination would have further been combined with Yamada to form the claimed invention. However, Yamada merely discloses a light-emitting device and does not even disclose a lead frame or how the device may be connected thereto.

Therefore, Yamada clearly does not teach or suggest a positive electrode connected by a bonding wire to the same surface of one of the first and second bonding pads as one of the pair of lead frames. Therefore, Yamada clearly does not make up for the deficiencies of the Genriyou/Nemoto combination.

In addition, Genriyou merely discloses a light emitting chip 102 presumably including a positive electrode (Genriyou at [0008]; Figure 1(A)). However, the location and size of any positive electrode is unclear. Further, nowhere does Genriyou teach or suggest any characteristics of the positive electrode, such as the thickness of the positive electrode. Thus, Genriyou certainly does not teach or suggest a positive electrode having a thickness of at least 5000Å.

Further, Nemoto certainly does not teach or suggest such a positive electrode of the claimed invention. Indeed, as shown in Figure 20 of Nemoto, the dominant light path in Nemoto is toward the electrodes. Therefore, Nemoto would prefer to have a light-transmissible electrode which is very thin.

Therefore, Nemoto does not make up for the deficiencies of Genriyou. Thus, even if Genriyou and Nemoto were combined, the combination would not teach or suggest a device having a positive electrode having a thickness of at least 5000Å.

Further, Yamada does not teach or suggest a positive electrode having a thickness of at least 5000Å. Instead, as noted by the Examiner, Yamada merely discloses an electrode having a thickness of 2000 Å (Yamada at col. 4, line 51). Moreover, Yamada is intended to provide a low resistance contact. Therefore, Yamada would prefer to make the electrode very thin in order to minimize a contact resistance.

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Therefore, Yamada clearly does not teach or suggest a positive electrode having a thickness of 5000Å. Therefore, Yamada clearly does not make up for the deficiencies of the Genriyou/Nemoto combination.

Therefore, Applicant submits that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of the claimed invention. Therefore, the Examiner is respectfully requested to withdraw this rejection.

B. The Hide Reference

The Examiner alleges that Genriyou would have been combined with Nemoto and Yamada, and that the Genriyou/Nemoto/Yamada combination would have been further combined with Hide to form the claimed invention of claims 25-37. Applicant submits, however, that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of the claimed invention.

First, Applicant submits that the Examiner is alleging that no less than four references would have been combined to reject the invention of claims 25-37. This is clearly unreasonable and necessarily would require impermissible hindsight. Therefore, based on this fact alone, the Examiner has failed to make a prima facie case of obviousness.

Further, Hide discloses a hybrid inorganic light-emitting device/luminescent polymer light-emitting source. The source includes an inorganic light-emitting source such as a p-n junction diode-containing device capable of emitting a first emitted output of light, and a photoluminescent polymer element positioned in the first emitted output of light (Hide at Abstract).

Applicant submits that these references would not have been combined as alleged by the Examiner. Indeed, these are directed to different problems. Specifically, Hide is directed to a hybrid device which contains a photoluminescent polymer. This is completely unrelated to the other references. Therefore, certainly no person of ordinary skill in the art would have considered combining these references, absent impermissible hindsight.

Further, the Examiner can point to no motivation or suggestion in the references to urge the combination as alleged by the Examiner. Indeed, the Examiner supports the combination by merely stating that it would have been obvious to combine the

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Genriyou/Nemoto/Yamada combination with Hide to generate a greater variety of colors. However, this is unrelated to a purpose of the claimed invention and, therefore, insufficient to support the combination.

Moreover, none of these references teaches or suggests "*a fluorescent material which is adjacent to said substrate and on an opposite side of said substrate from said light-emitting layer*" as recited, for example, in claims 25 and 26. As noted above, the novel design of the Applicant's invention allows a fluorescent material to be included so that it light of a constant color can be emitted for an extended period of time (Application a page 7, lines 18-22).

Clearly, the cited references do not teach or suggest these novel features. Indeed, the Examiner concedes that a Genriyou/Nemoto/Yamada combination would not teach or suggest a fluorescent material which is adjacent to the substrate and on an opposite side of the substrate from the light-emitting layer. However, the Examiner alleges that this is disclosed by Hide. We would submit, however, that the Examiner is not correct.

Specifically, the Examiner attempts to equate the photoluminescent layer 34 with the fluorescent material of the claimed invention. However, this is clearly incorrect.

The Application explains that "part of the light from the light-emitting device 20 is absorbed by the fluorescent material 201 ... to generate fluorescence" (Application at page 19, lines 15-18). The term "fluorescence" is defined as "luminescence that is caused by the absorption of radiation at one wavelength followed by nearly immediate reradiation usually at a different wavelength and that ceases almost immediately when the incident radiation stops" (*Webster's Universal Encyclopedic Dictionary*, 2002, page 707). In one exemplary embodiment, yttrium aluminum garnet (YAG) is used as the fluorescent material (Application at page 18, line 25).

In contrast, Hide discloses merely a photoluminescent material. The term "photoluminescence" is defined as "luminescence induced by the absorption of infrared radiation, visible light, or ultraviolet radiation" (*Webster's New Universal Unabridged Dictionary*, 1996, page 1459).

Thus, clearly, a photoluminescent material is not necessarily a fluorescent material which fluoresces. That is, the mere fact that a material absorbs some form of radiation to induce a luminescence, does not necessarily mean that the material fluoresces (e.g., see

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Atkins, P. W., *Physical Chemistry*, 3rd Ed., 1986, pages 470-472, a copy of which is attached hereto as Exhibit 1).

Therefore, Hide clearly does not teach or suggest a fluorescent material. Therefore, Hide clearly does not make up for the deficiencies of the Genriyou/Nemoto/Yamada combination (arguendo).

Therefore, Applicant submits that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of the claimed invention. Therefore, the Examiner is respectfully requested to withdraw this rejection.

C. The Oshio Reference

The Examiner alleges that Genriyou would have been combined with Nemoto and Yamada, and that the Genriyou/Nemoto/Yamada combination would have been further combined with Oshio to form the claimed invention of claim 38. Applicant submits, however, that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of the claimed invention.

Applicant again points out that the Examiner is alleging that no less than four references would have been combined to reject the invention of claim 38. This is clearly unreasonable and necessarily would require impermissible hindsight. Therefore, based on this fact alone, the Examiner has failed to make a prima facie case of obviousness.

Further, Oshio discloses a semiconductor light emitting device includes a semiconductor light emitting element, a resin stem having a thermosetting resin on the resin stem so as to cover the entire upper surface and continuous upper part of side surfaces of the resin stem to a predetermined depth (Oshio at Abstract).

Applicant submits that these references would not have been combined as alleged by the Examiner. Indeed, these are directed to different problems. Specifically, Oshio is merely directed to a method of manufacturing a light-emitting device which manufactures a lens easily (Oshio at col. 1, lines 58-63) which is completely unrelated to the other references. Therefore, certainly no person of ordinary skill in the art would have considered combining these references, absent impermissible hindsight.

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Further, the Examiner can point to no motivation or suggestion in the references to urge the combination as alleged by the Examiner. Indeed, the Examiner supports the combination by merely stating that it would have been obvious to combine the Genriyou/Nemoto/Yamada combination with Hide to focus the light generated from the light-emitting chip. However, this is unrelated to a purpose of the claimed invention and, therefore, insufficient to support the combination.

Moreover, Oshio does not teach or suggest *"wherein said positive electrode is connected by a bonding wire to the same surface of one of said first and second bonding pads as one of said pair of lead frames"* as recited, for example, in claim 19 from which claim 38 depends.

As noted above, the novel design of the present invention allows the use of bonding wires for connecting the electrodes of the light-emitting element to the bonding pads on the base. This allows the bonding pads to be formed on the base so as to maximize a distance between the lead frames, which facilitates attachment of the lead frames to the bonding pads.

Clearly, Oshio does not teach or suggest these novel features. Indeed, the Examiner relies on Oshio as allegedly disclosing a sealing resin. Further, Oshio merely discloses a bonding wire 4 and a lead 22 (Oshio at Figure 4). However, nowhere does Oshio teach or suggest a bonding pad or a positive electrode connected by a bonding wire to the same surface of a bonding pad as a lead frame. Therefore, Oshio clearly does not make up for the deficiencies of the Genriyou/Nemoto combination.

Therefore, Applicant submits that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of the claimed invention. Therefore, the Examiner is respectfully requested to withdraw this rejection.

III. FORMAL MATTERS AND CONCLUSION

In view of the foregoing, Applicant submits that claims 14-38, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

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Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

Date:

9/4/03



Phillip E. Miller, Esq.
Registration No. 46,060

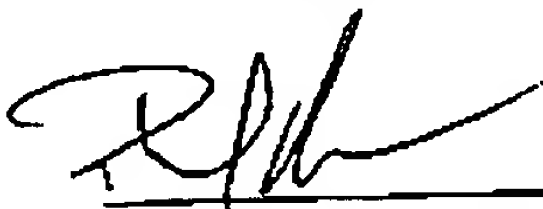
McGinn & Gibb, PLLC
8321 Old Courthouse Road, Suite 200
Vienna, VA 22182-3817
(703) 761-4100
Customer No. 21254

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CERTIFICATION OF FACSIMILE TRANSMISSION

I hereby certify that I am filing this Amendment Under 37 C.F.R. § 1.116 by facsimile with the United States Patent and Trademark Office to Examiner Eugene Lee, Group Art Unit 2815 at fax number (703) 872-9319 this 4th day of September, 2003.



Phillip E. Miller, Esq.
Registration No. 46,060